

# DC POWER SUPPLY

MODEL: GPR-3020

## INSTRUCTION MANUAL



SALES AND SERVICE

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**GOOD WILL INSTRUMENT CO., LTD.**

# DC POWER SUPPLY

MODEL: GPR-3020

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## 1. INTRODUCTION

The regulated DC power supply have been designed to provide the most often required in the laboratory, schools and production lines.

The output voltage is continuously adjustable between 0 to rating voltage in one range by means of a coarse and fine potentiometer, the load current may have any value from 0 to rating current and adjusted by means of a potentiometer. Both outputs can accurately read on voltmeter and ammeter.

Both stability and ripple are extremely good to meet the requirements of modern circuit design. The unit can be used as either constant voltage or current source. The various operation mode are described in more detail in the Operation Instruction section.

For applications when outputs greater than rating V is need, the unit can be connected up in series.

## 2. SPECIFICATION

2-1	General	
	Main supply	110V/120V/220V/240V $\pm$ 10% 50/60 Hz (Transformer taping)
	Dimensions (HxWxD)	172x120x300mm
	Rating and weight	see Table 2-1

Table 2-1

	Max. Rating		Weight
	Voltage (V)	Current (A)	Kg. Appro.
GPR-1810	18	1.0	
GPR-1830	18	3.0	
GPR-1850	18	5.0	
GPR-3010	30	1.0	
GPR-3020	30	2.0	
GPR-3030	30	3.0	
GPR-6010	60	1.0	
GPR-10H10	100	1.0	

### Operation

Operation Temperature & Humidity

Storage Temperature & Humidity

Accessories

### Series Operation

0°C to 40°C, < 80%

-10°C to 70°C, < 70%

Fuse	2
Test Lead GTL-	2
Operation Manual	1

### 2-2 Constant-Voltage Operation

1. Output voltage ranges 0-rating voltage continuously adjustable.
2. Voltage regulation  
line regulation  $\leq 0.01\%+3mV$   
load regulation  $\leq 0.01\%+3mV$
3. Recovery time  $\leq 100\mu s$  typical value
4. Ripple voltage  $\leq 1mV$  rms
5. Temperature coefficient  $\leq 300PPM/^{\circ}C$

### 2-3 Constant-Current Operation

1. Output current range 0 to rating current continuously adjustable.
2. Current regulation  
line regulation  $\leq 0.2\%+3mA$   
load regulation  $\leq 0.2\%+3mA$
3. Ripple current  $\leq 3mA$

### 2-4 Meter

1. Voltmeter full scale of the rating voltage 2.5 class.
2. Ammeter full scale of the rating current 2.5 class.

### 2-5 Insulation

- Between chassis and output terminal 20M $\Omega$  or above (DC 500V)  
Between chassis and AC cord 30M $\Omega$  or above (DC 500V)

## 3. THEORY OF ACTION

### General

The power supply consists of an AC input circuit and transformer, a bias supply consisting of a rectifier and filter and reference voltage source, a main regulator circuit consisting of the main rectifier and filter, a series regulator, a current comparator, a voltage comparator, a reference voltage amplifier, a instant over load protection circuit and a relay control circuit.

The circuit element are several of integrated circuit (U101, U102, U103, U104, U105).

The circuit arrangement is shown in block diagram from Fig. 1.

The circuit is discussed with reference to the block diagram Function Description.

Single phase input power is applied to transformer through the input circuit.

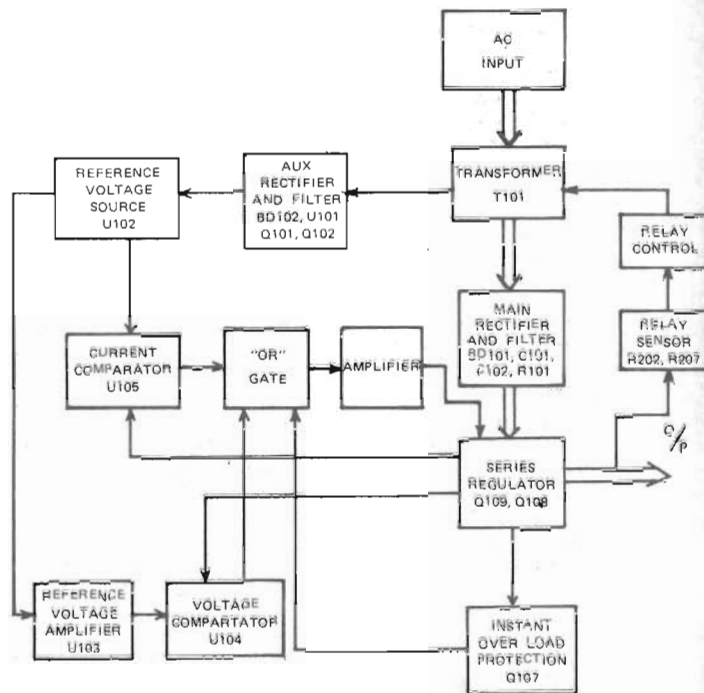
Auxiliary rectifier BD102 provides a bias voltage filtered by capacitor C103, C104 for the preregulator U101, Q101, Q102, that provides a regulator voltage for U102, U103, U104, U105, Q103, Q104, Q105, Q106, Q201, Q202, Q203, Q204 and Q205.

The main rectifier, a full wave bridge rectifier, provides the power which is filtered by capacitor C101, C102 and then regulated via a series regulator and deliver to the output.

U105 acted as a current limiter. When current is over predominate rating, it acted and decreased the current U102 provides a reference voltage for U103, U105, U103 is a inverter amplifier. U104 is a comparator amplifier. It's may be made comparator for reference voltage and detector feedback voltage, and then deliver to Q103, Q104, this time output voltage is calibrated.

Q107 is instant over load protection circuit, Q107 turn on when voice respose load adds at instant. It controls Q103 current magnitude of IB makes output current limited.

The relay control circuit provides limited power dissipation in series regulator.



## OPERATION INSTRUCTIONS

### 4-1 Precaution

1. AC input  
AC input should be within the range of line voltage  $\pm 10\%$  50/60Hz.
2. Installation  
Avoid using the supply in a place where the ambient temperature exceeds  $40^{\circ}\text{C}$ . The heat sink located at the rear of the supply must have sufficient air space for radiation.
3. Output voltage overshoot  
Voltage between output terminals never exceeds the present value when the power is turned on or off.
4. Constant-Voltage, Current Characteristics

The working output characteristics of this power supply SERIES called constant-voltage/constant current automatic crossover type. Permits continuous transition from constant-current to constant-voltage operation mode in response to the load change.

The intersection of constant-voltage and constant-current operation modes is called crossover point Fig. 2 shows the relationship between this point and the load.

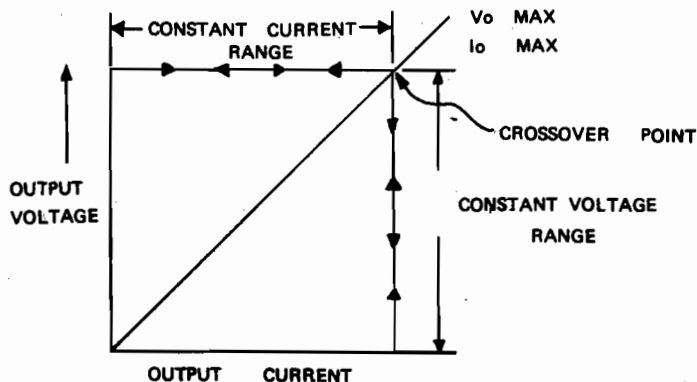


FIG. 2

### 4-2 Description of panel

#### Front panel

- |                         |  |
|-------------------------|--|
| 1. CC indicator         | light when output current exceeds constant current.          |
| 2. CV indicator         | light when the power turn on and constant voltage operation. |
| 3. Voltage coarse       | for the coarse adjustment of the output voltage.             |
| 4. Fine                 | for the fine adjustment of the output voltage.               |
| 5. Current              | for the adjustment of the output current.                    |
| 6. HI & LO              | for upper and lower scale of ammeter.                        |
| 7. Power on             | on/off switch for the line input.                            |
| 8. "+" output terminal  | positive polarity. (Red)                                     |
| 9. "GND" terminal       | connected to chassis internally (Yellow)                     |
| 10. "-" output terminal | negative polarity. (Black)                                   |
| 11. Ammeter             | Indicates the output current.                                |
| 12. Voltmeter           | Indicates the output voltage.                                |
- Rear panel
13. Fuse holder
  14. Power cord

FIG. 2 FRONT PANEL

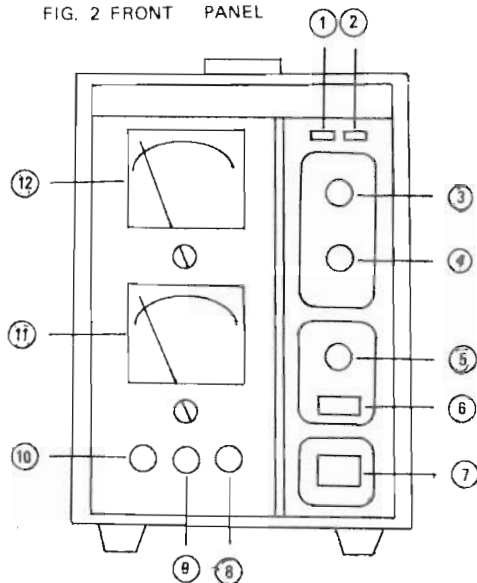
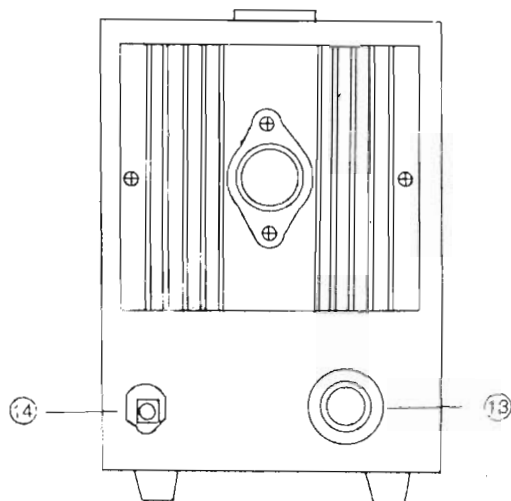


FIG. 3 REAR PANEL



#### 4-3 Single operation

Use the supply as it is for single operation.

1. Set "Power On" switch to down position.
2. Make sure that line voltage is correct for the input power voltage.
3. Plug power cord into the power outlet.
4. Set "Power On" switch to on position.
5. Adjust "Voltage" and "Current" control to the desired output voltage and current.
6. Connect the external load to the output binding posts. Make sure both "+" and "-" terminals are connected correctly.

#### Note:

For constant voltage operation the output is continuously adjustable over the whole range of 0—rating voltage. The load current can then be limited to any value between 5%—rating current.

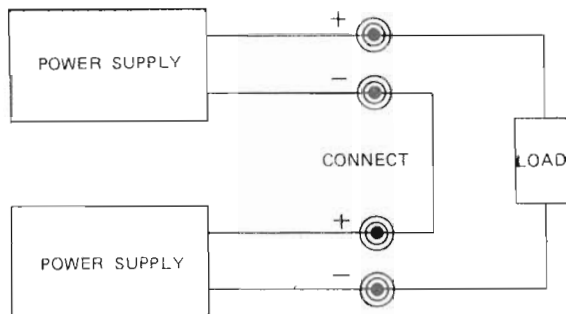
For constant current operation the output is continuously adjustable over the whole range, and the voltage can then be limited to any value from 0—rating voltage.

#### 4-4 Series operation

Two supplies can be connected in series for higher voltage than specified. You may utilize twice the voltage and the rated current for 1. supply operation.

Refer to Fig. 5 for connection procedure.

FIG. 5



### 5. MAINTNANCE

When a faulty part has been replaced or the output voltage, deviates adjust the power supply as follows.

#### 5-1 Adjustment of 0-volt voltage

Turn the voltage control knob full counterclockwise to the minimum voltage position. Adjust the semifixed resistor VR105 (Fig. 6) on the printed board for a meter reading of 0V.

#### 5-2 Adjustment of the rating voltage

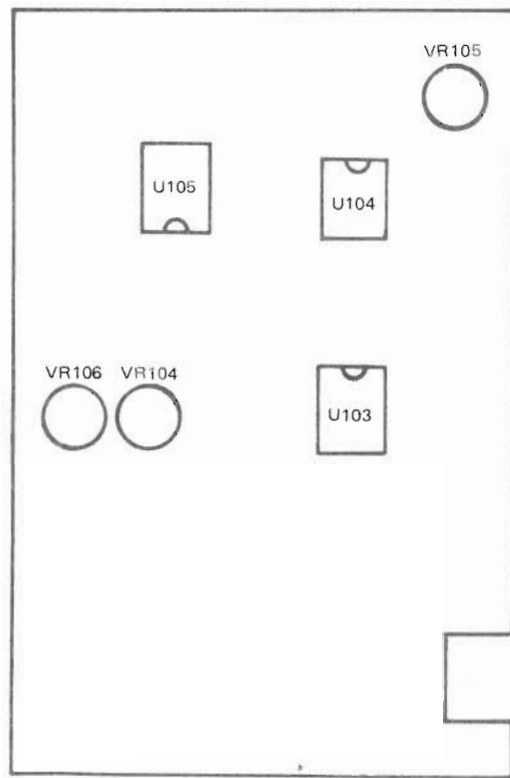
Turn the voltage control knob full clockwise to the maximum voltage position. Adjust the semifixed resistor VR104 (Fig. 6) on the printed board for a meter reading of full scale.

#### 5-3 Adjustment of the rating current

1. Turn the voltage and current knob full counterclockwise to the minimum position.
2. Short the output terminals.
3. Turn the voltage knob to the center position, and slowly increase the current by turning current knob.

4. Adjust the semifixed resistor VR106 (Fig. 6) on the printed board for a meter reading of full scale. (When the current control knob is maximum position.)

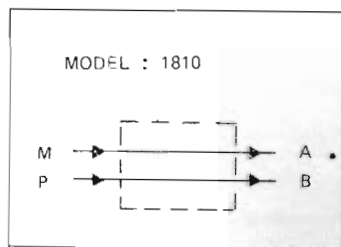
FIG.6



## 6. PART LIST

MODEL	BD101	C101	C102	C112	C109	C107	R112	R131	R132	R101	Q108	Q109
1810	2A	2200 $\mu$ 35V		100 $\mu$ 25V	2.2 $\mu$ 25V	2.2 $\mu$ x 2 25V	18K	0.5 $\Omega$		6K 1W	2N3055	
1830	4A	6800 $\mu$ 35V		100 $\mu$ 25V	2.2 $\mu$ 25V	2.2 $\mu$ x 2 25V	18K	0.2 $\Omega$		2K 1W	2N3055	
1850	6A	6800 $\mu$ 35V	6800 $\mu$ 35V	220 $\mu$ 25V	2.2 $\mu$ 25V	2.2 $\mu$ x 2 25V	18K	0.2 $\Omega$	0.2 $\Omega$	1.5K 2W	2N3055	2N3055
3010	2A	2200 $\mu$ 63V		100 $\mu$ 50V	2.2 $\mu$ 35V	2.2 $\mu$ x 2 35V	33K	0.5 $\Omega$		10K 1W	2N3055	
3020	4A	4700 $\mu$ 63V		220 $\mu$ 50V	2.2 $\mu$ 35V	2.2 $\mu$ x 2 35V	33K	0.2 $\Omega$		4.7K 1W	2N3055	
3030	4A	6800 $\mu$ 63V		220 $\mu$ 50V	2.2 $\mu$ 35V	2.2 $\mu$ x 2 35V	33K	0.3 $\Omega$	0.3 $\Omega$	4.7K 2W	2N3055	2N3055
6010	2A	4700 $\mu$ 50V	4700 $\mu$ 50V	220 $\mu$ x 2 50V	2.2 $\mu$ x 2 35V	2.2 $\mu$ x 2 35V	62K	0.5 $\Omega$		18K 1W	2SD733	
10H10	2A	4700 $\mu$ 63V	4700 $\mu$ 63V	220 $\mu$ x 2 50V	2.2 $\mu$ x 2 50V	1 $\mu$ x 2 350V	100K	1 $\Omega$	1 $\Omega$	30K 2W	2SD733	2SD733

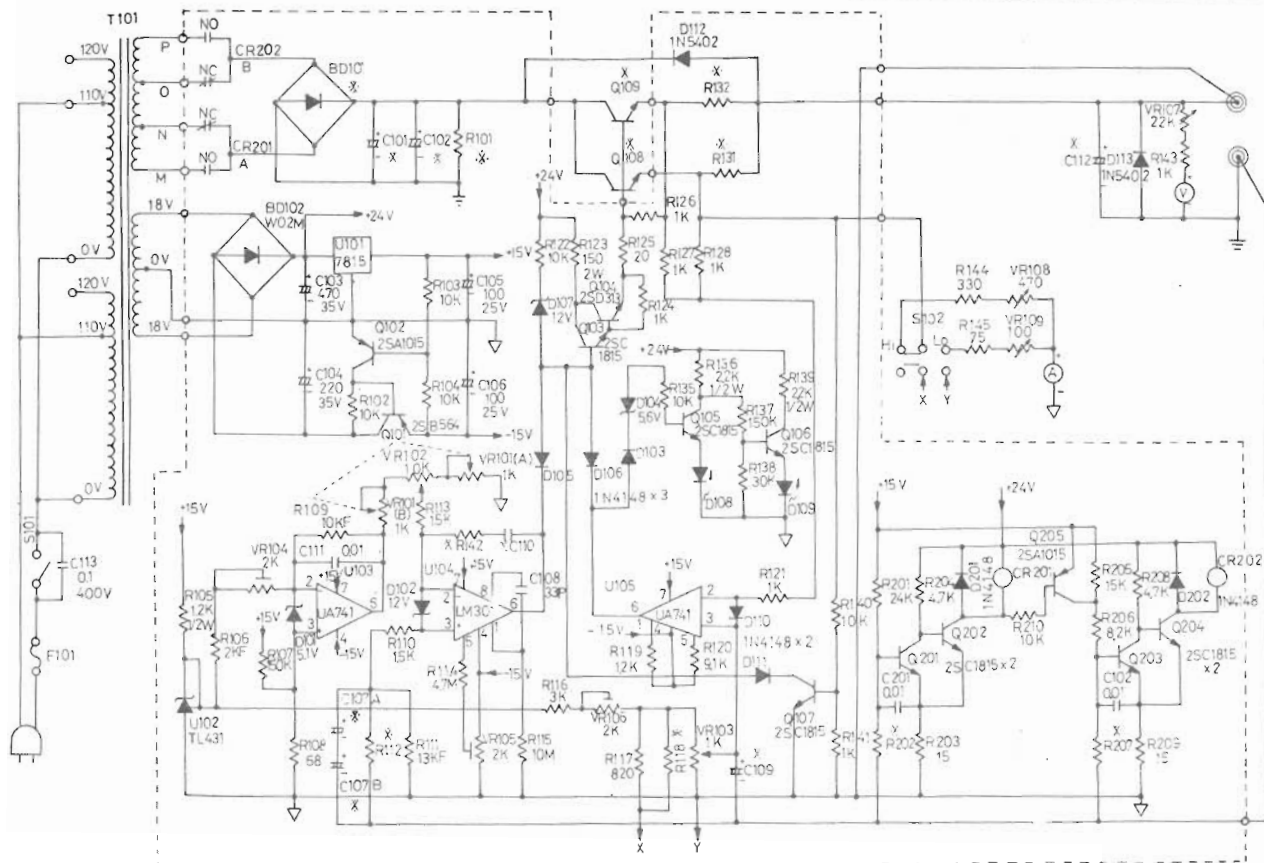
FOR RELAY CONTROL CIRCUIT



MODEL	R202	R207
1830	18K	
1850	18K	
3010	30K	
3020	30K	15K
3030	30K	15K
6010	60K	30K
10H10	100K	50K



## CIRCUIT DIAGRAM



1. ADJUSTED IN FACTORY

2. CIRCUITRY ARE SUBJECT TO CHANGE WITHOUT NOTICE FOR FURTHER IMPROVEMENT

3. RESISTANCE VALUES IN  $\Omega$  1/4 WATT AND CAPACITANCE IN  $\mu F$  UNLESS OTHERWISE SPECIFIED

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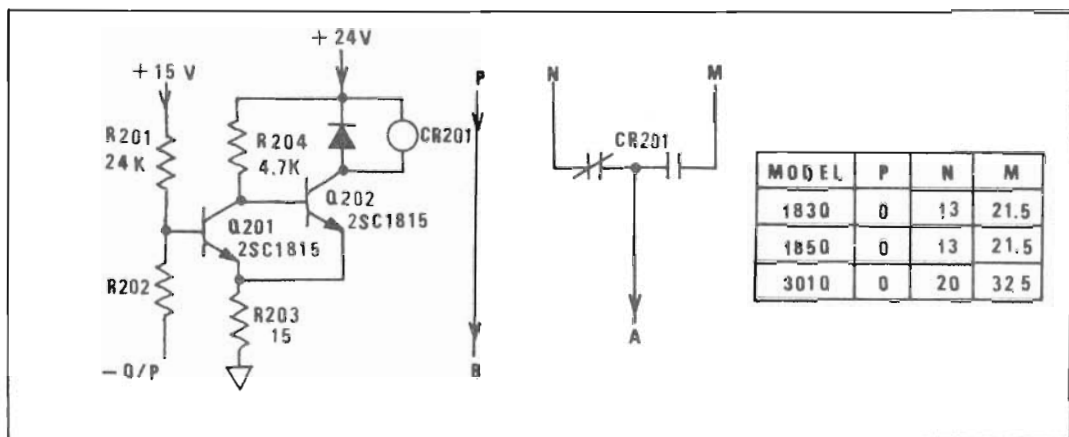
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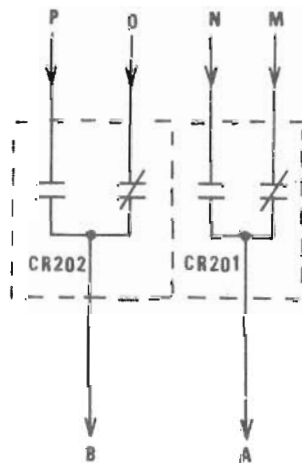
NAME

DESCRIPTION

DRAWING NO



MODEL	P	O	N	M
3020	0	6.5	20	32.5
3030	0	6.5	20	32.5
6010	0	13.5	32.5	60
10H10	0	23	51	97



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